

Saving water, money & the environment

Background

The manufacturing industry in Sydney uses approximately 130 million litres of water every day. This represents 30% of the total water used by business. A significant amount of water is applied through the use of spray nozzles.

Spray nozzles are precision components used in many processes, often critical to plant sanitation and final product quality. Unfortunately, spray nozzles are frequently neglected during a plant's busy maintenance schedule. This can impact significantly upon operating costs.

Common applications of spray nozzles include:

- 🔦 Cleaning, washing and rinsing
- 🔦 Coating
- 🔦 Cooling
- 🔦 Dust control
- 🔦 Spray drying
- 🔦 Humidifying
- 🔦 Air and gas scrubbing.



Benefits of using spray nozzles

The benefits of spray nozzles include:

- 🔦 Reduced operating costs
- 🔦 Reduced water consumption
- 🔦 Efficient and effective cleaning
- 🔦 Ability to operate with high temperature liquids
- 🔦 Reduced cleaning time
- 🔦 Variable spray patterns to suit desired flow characteristic
- 🔦 Ability to restrict flows to specific rates.

Worn nozzles can waste more than \$76,000 p.a

Worn spray nozzles can lead to significant wastage, in both water and waste treatment costs. In dollar value, it can be very costly. A typical example given below shows how water wastage costs more than \$76,000 p.a.

Typical operation:	35 nozzles, 16 hr/day, 300 day/year
Typical nozzle flow:	12 L/min @ 50% spray angle
Typical wastage with worn nozzle:	30% (3.6 L/min/nozzle = 121 kL/d wastage)
Result:	Pressure decreases and spray angle narrows, with decreased coverage
Loss:	\$76,000 p.a.

Note: Chemical and other treatment costs have not been included

Being smart with water makes good business sense



GOOD NOZZLE



CAKED NOZZLE



DAMAGED NOZZLE



HEAT DAMAGED NOZZLE

Common problems with spray nozzles

Nozzle performance can be compromised for various reasons. The most common problems encountered are described below:

- 🔥 **Erosion/wear** - The gradual removal of metal leads to increased flow, larger drop size and decreased pressure.
- 🔥 **Corrosion** - The chemical action of the sprayed material will produce similar effects to that caused by erosion.
- 🔥 **Temperature** - Liquids sprayed at elevated temperatures may soften or breakdown nozzles.
- 🔥 **Caking** - The build-up of material on the edges of the orifice, caused by evaporation of the liquid, obstructs the internal flow passages.
- 🔥 **Clogging** - Unwanted solid particles inside the orifice can restrict flow.
- 🔥 **Improper assembly** - Improper positioning of internal valves and gaskets following cleaning may cause leakage and inefficient spray performance.
- 🔥 **Accidental damage** - Damage to the orifice by inadvertent scratching or dropping can effect spray flow in a number of ways.

How to detect ineffective spray nozzles

There are several ways of ensuring that spray nozzles are operating properly. These are listed below:

- 🔥 **Flowrate** - Periodic flow checks can identify nozzle deterioration.
- 🔥 **Spray pattern** - Visual inspection can usually reveal changes to spray pattern uniformity. Special equipment can be utilised if accurate information is required.
- 🔥 **Spray pressures** - With centrifugal pumps, spraying pressures remain about the same, but the liquid volume increases with wear. With positive displacement pumps, the spray volume remains constant while the spray pressure declines with wear. Increased spray pressures may indicate clogging of the nozzles.

- 🔥 **Drop size** - Increased drop size can be detected through visual inspection.
- 🔥 **Nozzle alignment** - Poor overall spray coverage can be detected visually.

Maintaining Spray Nozzles

Poorly maintained spray nozzles can cost companies thousands of dollars a year in wasted water, increased utility and chemical costs and rejected product. Nozzles require regular inspection and maintenance and sometimes replacement, in order to preserve final product quality and to maintain production processes on a cost-efficient basis.

Therefore implementing an effective maintenance program is crucial. Inspection frequency depends on a number of factors including application, liquid used and nozzle material. Some systems require daily inspection, while others can be checked monthly. For critical applications, special testing (flowrate, pressure and spray distribution analysis) may also be required. Check with your supplier to determine the optimum maintenance schedule.

Case Study: Benefit to Coca Cola Amatil

Since joining the **every drop counts** program, Coca Cola Amatil Northmead site has been actively seeking ways to reduce water consumption. One such opportunity was discovered at the bottle rinsing area. Before filling bottles with product, rinsing with treated town water is required. The rinse water is then sent to waste treatment and finally to sewer.

It was recognised that the rinser nozzles were not designed with water efficiency in mind. Coca Cola Amatil sourced a spray nozzle that delivered a far more efficient spray, providing excellent coverage, yet minimising water usage. The new nozzles reduced water usage on two lines by 176 l/min – a reduction of 46%! The annual projected savings are 37,400 kL and \$78,500. Plans are now in place to retrofit spray nozzles in their Smithfield plant.

Developed with the assistance of Spraying Systems Co. Pty Ltd.

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